# ANALYSIS OF VERTICAL AXIS WIND TURBINE WITH INCREASING THE NUMBER OF BLADES AND CHANGING THE MATERIAL

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**Abstract -** *Among the various non-assembly methods for generating electricity, the air has found its place to function efficiently. Considering the spatial characteristics of our region, a vertical axis windmill will work well in power generation.*

*Wind power is the conversion of wind into the most useful species through wind turbines. Most modern wind power is generated electronically by converting turbine blades into electrical energy using an electric generator.*

*In windmills wind power is used to convert equipment into physical activity, such as crushing grain or pumping water. Wind power is used on large wind farms on national power grids and in small turbines to provide electricity to rural or isolated areas.*

## 1. INTRODUCTION

Horizontal wind turbines (HAWTs) have been the focus of much of the wind-related research over the past few decades and represent a significant portion of the installed capacity. However, research work on vertical-axis wind turbines (VAWTs) has continued in parallel, usually focusing on a smaller scale, where different configurations and methods have been proposed. It has been suggested that VAWTs are suitable for power generation under conditions where conventional HAWTs are unable to provide optimal efficiency, such as turbulent winds with a strong variation in the airway. Another important advantage is that VAWTs travel everywhere, receiving air in any direction other than any form of yawning. Recent research has also shown that it is possible to increase the global performance of VAWTs by establishing them with a strong sequence of rotating orientation. The rotating VAWT column was estimated to provide a 50% to 100% increase in power, compared to the same number of separate VAWTs, confirming the validity of the idea proposed by Daribi. In this way, VAWT farms can achieve higher power output per unit area (W / m2), and as a result, less space than HAWT equivalent farms. Other options to increase VAWT output power, such as inlet guide-vanes are also explored. Despite all the recent advances, VAWT economically has not yet competed against HAWT, due to its declining energy efficiency. In this work, we therefore focus on ways to improve their global profits, by investigating the use of cheap manufacturing technology and the selection of materials used to produce blades. The blades of H-type VAWTs, also known as giro Mills, are particularly suitable for low-cost production, due to their simple shape (no taper, no twisting).

With a new machine with equal aerodynamic performance compared to existing blades, lowering production costs is a direct way to improve return on investment. Low production costs are usually obtained through a large series of production technologies. It has recently been suggested that larger VAWT farms farther apart may benefit from the power supply than existing HAWT farms. The market acquisition of this understanding will require the use of a very large volume of turbines (and blades), thereby increasing the need for production technology for large series.

### 1.1 MATERIALS USED

a) CARBON FIBER

Carbon fibers or carbon fibers (excluding CF, graphite fiber or graphite fiber) are fibers of about 5 to 10 micrometers (0.00020–0.00039 in) in diameter and are composed mainly of carbon atoms. Carbon fiber has several advantages including high durability, very strong strength, low to moderate strength, high chemical resistance, high temperature tolerance and low temperature rise. These structures have made carbon fiber very popular in aerospace, civil engineering, military, and automotive, as well as other competitive sports. However, they are more expensive compared to similar fibers, such as glass fibers, basalt fibers, or plastic fibers.

To produce carbon fiber, carbon atoms are grouped together with crystals that are slightly aligned or aligned with a long fiber axis as the crystal alignment provides a high degree of power-to-volume (in other words, its magnitude). Several thousand carbon fibers are woven together to form a toy, which can be used on its own or woven into fabric.

b) PVC

Polyvinyl chloride is the world's third-largest synthetic plastic polymer after polyethylene and polypropylene. About 40 million tons of PVC are produced annually.

PVC comes in two basic forms: solid (sometimes abbreviated as RPVC) and flexible. Solid PVC form is used for pipe construction and profile systems such as doors and windows. It is also used to make bottles, non-food packaging, food wrappers, and cards (such as bank or membership cards). It can be made softer and more flexible with the inclusion of plastics, the most widely used phthalates. In this form, it is also used for plumbing, electrical wiring, leather imitation, flooring, signage, phonograph records, inflatable products, and many applications when replacing rubber. In cotton or linen, it is used for the production of fabric. Pure polyvinyl chloride is durable, durable. It does not dissolve in alcohol but melts slightly in tetrahydrofuran. high power-to-volume ratio (in other words, it is powerful in its size). Several thousand carbon fibers are woven together to form a toy, which can be used on its own or woven into fabric.

### 1.2 WORKING PRINCILE

In VAWT the airfoils are classified as symmetrical and have an angle at which the airfoils are set according to structure. This setting applies equally to any direct air. When the VAWT rotor rotates, the airfoils move forward in the air in a circular motion. As for the blade, the resulting air flow creates a slightly different angle of attack on the blade. This creates the absolute power of a diagonal forward with a straight line of action. This energy can be generated internally past the turbine axis at a certain distance, giving positive torque to the shaft. As the airfoil rotates on the back of the apparatus, the attack angle shifts to another signal but the generated energy is still on the rotating side, because the wings are equal. The rotor rotates at a rate that is not related to the wind speed. The energy produced by torque and speed can be extracted and converted to useful energy. Raise and drag forces near the adjacent air proximity. When the rotor is stationary and when the wind speed is quite high then the rotor should already rotate to produce torque. So design often does not start.

## 2. Design of the VWAT with different number of Blades

Blade construction is done on CAD Solid works software. Solid works Computer-assisted design software with additional features presented in simulations that include functions. A variety of 3d modeling operations such as extrude, revolve, shell, pattern, and standard gear production, carrying can be done easily. Blade construction is done on CAD Solid works software. Solid works Computer-assisted design software with additional features now presented to integrate simulation tasks. A variety of 3d modeling operations such as extrude, revolve, shell, pattern, and standard gear production, carrying can be done easily.

## 3. Simulation in ANSYS Benefits in using ANSYS

• ANSYS can import all types of CAD geometry (3D and 2D) from different CAD software and create simulations, and has the ability to create one easily. ANSYS has an inbuilt CAD that develops software similar to Design Modele.

• ANSYS has the ability to create advanced and realistic engineer simulations naturally with a variety of communication algorithms, time-based simulations and abstract object models.

• ANSYS has the ability to combine various physics into one site and perform analysis. Such as combining thermal analysis with structural analysis and combining hot liquid flow with structure, etc.

• ANSYS has now integrated its development into a product called ANSYS AIM, which is capable of performing multi-physics simulations. It is a single platform that can embrace all forms of physics and create simulations.

## 4. MESHING

The process of dividing geometry into finite elements is called meshing. The meshing process is performed to divide the geometry into elements with each node element. The nodes are the stages in which the calculations are partially subdivided into solving Navier Stokes calculations in the case of CFD. The meshing produced here is a system-controlled meshing. The different elements available are tetrahedral elements, hexahedral elements, square elements etc. Tetrahedral elements are built in an outdoor enclosure. Square elements are built into the blade section.

## 5. SETTING UP OF BOUNDARY CONDITIONS

1. Install viscous model: The viscous model selected here is K epsilon - standard. The model is sufficient for wind turbine problems to deal with the turmoil that is taking place here.

2. Use the equipment:

Additional materials include Carbon fiber, PVC etc. The overcrowded prices associated with equipment are available and thus items are added to the library.

3. Apply boundary conditions.

The boundary condition we provide in the entry phase for air movement. The air is given a speed of 8.33 m / s and atmospheric pressure. Specified outlet is a pressure outlet that also has air pressure.

## 6. SOLUTION

The solution method used here is a simple method with dynamic and dynamic kinetic energy and a turbulent level of destruction. These solutions have enabled the solution to come together in a very short time.

The remainder of the temporary CFD analysis is given above. The calculation is carried out with a step size of .1 sec per 100 steps. The remainder chart is provided here.

## 7. CONCLUSION

CFD analysis and structural analysis were performed on the wind turbine. Interpretation of analytical results enables us to detect the movement of smooth air over a wind turbine. It is very important to study the aerodynamic effects of air flow on turbine blades. Streamline analysis proves that the air will create a dense surface on the turbine blades and after you have just passed over it you have a gravitational force that allows for further movement of the turbine blades. Traction capacity is greater than the 3 blade configuration so more power is generated by the 3 blade configuration. The gravitational force produced is more than the value of 20 N which is sufficient enough to move the blade to generate electricity.

All blade configurations produced the same aero dynamic characteristics with only a slight variation of the temporal reaction value. The temporary value increases slightly as the number of blades increases. The difference is due to the surface area under high pressure air pressure. Two different materials extracted here PVC and Carbon fiber have produced the same current values and strength. These patterns clearly prove that both building materials produce the same movement of the blades. So further to study the modification of the element created we continued the analysis of the structure of the turbine blades. Structural analysis proved that the pressure distribution across all blades had significant differences. The highest amount of stress is found in carbon fiber. So more energy will be produced by this material than PVC.

## 8. REFERENCES

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